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ABSTRACT

This study explored recent developments related to the application of telecommunications technology in academic and research libraries. The study focused on 4 topics and 10 libraries exemplifying the topics that were selected for case study. The topics and case study libraries are: (1) local area networks--Cornell University and the University of California at San Diego; (2) the library and campus network--Brown University, Johns Hopkins University, and Vanderbilt University; (3) links and common interfaces for bibliographic systems--New York University, the University of Southern Colorado, and Florida International University; and (4) alternatives to remote access--Texas A&M University and the University of Pennsylvania. Copies of library planning documents were reviewed and followed up with telephone interviews. The situation at each library is summarized, and observations and conclusions based on this information are presented. The report concludes by offering a summary and recommendations in three areas: the need for library telecommunications strategies; factors in telecommunications strategy formulation; and developing strategic goals. (30 references) (MES)

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TOWARD TELECOMMUNICATIONS STRATEGIES IN ACADEMIC AND RESEARCH LIBRARIES

TEN CASE STUDIES OF DECISION-MAKING AND IMPLEMENTATION

An OMS Occasional Paper

OCTOBER 1988

by THOMAS KINNEY

Office of Management Services
Association of Research Libraries
Washington, DC

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INTRODUCTION

The expanding role of computer technology—in society in general and libraries in particular—has been accompanied by an expanding role also for telecommunications technology. In fact, many operations of virtually all academic and research libraries depend heavily upon telecommunications, including:

- Operation of local online systems
- Interaction with national and regional bibliographic and resource sharing networks
- Links to campus-wide networks
- Access to remote databases and networks
- Links among library workstations
- Telephone system operation

How to make the best use of this technology now ranks as one of the major challenges facing academic and research library managers. As Pat Molholt has noted *(Molholt, P. 1)*:

> *Today's librarians face a variety of options in their use of technology, including the technology that links them all together—telecommunications. Choosing telecommunications services presents the newest, and perhaps most challenging, set of options librarians face.*

In order to choose among these options, library managers now face the task of becoming "telecommunications literate," just as they have to become computer literate in order to deal with the increasing computerization of libraries. Richard Boss suggests that "even the librarian who plans to delegate most of the responsibility for telecommunications procurement should become telecommunications literate in order to avoid losing control of one of the major decision-making areas in the library of the 1990s" *(Boss, P. 141)*.

The goal of this study is to explore recent developments related to the application of telecommunications technology in academic and research libraries and to recommend ways in which library managers may better understand and make decisions relating to its use.

Background

While the focus of this study is on the transmission of data between computing devices, the phrase "telecommunications technology" is used broadly to include all technology used in the transmission of information—voice, data, and video—through the use of electromagnetic signals.

The case study method allows a detailed and specific exploration of actual applications of telecommunications technology. The case study descriptions focus not so much on technical details but rather on why libraries have made certain choices and the benefits and costs associated with those choices. *Boss*, *Learn*, and *Martin (James)* are suggested as starting places for library managers who wish a more technical discussion.

In order to keep the scope of the study manageable, it focuses on four topics. A number of library managers with extensive experience and expertise in library automation generously agreed to consult with the author in the selection of these topics as well the identification of a group of possible case study libraries.

Contacts at each case study library sent copies of planning documents to the author. These were reviewed and followed up with phone interviews. The four topics and ten case study libraries selected are:

Local Area Networks (LANs)
Cornell University (Mann Library)
University of California, San Diego

The Library and the Campus Network
Brown University
Johns Hopkins University
Vanderbilt University

Links and Common Interfaces for Bibliographic Systems
New York University
University of Southern Colorado
Florida International University

Alternatives to Remote Access
Texas A&M University
University of Pennsylvania

The first three topics illustrate the role of telecommunications technology in supporting communication at different levels: linking workstations within the library; linking the library to the campus network; and linking the library's local online system to other bibliographic systems.

The fourth topic was selected not to illustrate an innovative use of telecommunications technology, but rather to place this technology in the broader context of overall library decision-making. It describes how alternatives to remote access are being used to complement traditional online reference searching.

Overview of Themes

Several general themes emerge from the experiences of the case study libraries:

1. Telecommunications technology is being applied in innovative ways in nearly all areas of academic and research library operations.
2. As academic and research libraries have moved their catalogs online and begun to explore other online services for their users, and as campus-wide networks have come to play an increasing role in universities, the relationship between the library and the campus-wide telecommunications network has become increasingly important.
3. With the expanding availability of information in machine-readable form such as online, CD-ROM, and magnetic tape, academic and research libraries are increasingly concerned not only with acquiring the information their users need, but also with finding the appropriate combination of formats in which to deliver this information.
4. Effective use of telecommunications technology requires a significant commitment of staff resources, including the development of specialized in-house expertise.
5. The significant start-up costs involved in the development and use of new telecommunications technology in academic and research libraries can often be absorbed by the university and/or a vendor, or supported by grant funds.

The Need for Strategies

In the concluding section of this study the author suggests that choices related to the use of telecommunications technology in academic and research libraries are in fact strategic decisions, comparable in importance to decisions in the more traditional areas of collection management, staff development, and user services. Cited as helping raise telecommunications technology planning into the strategic arena are its centrality to many ongoing library operations, its significant costs in terms of budget and staffing, and its increasing role in campus and scholarly activities.

The author suggests a number of factors at the library, campus, and national levels that libraries can analyze as they begin to formulate strategies for telecommunications. A set of ten strategic goals are presented as a starting point for discussion within individual libraries. These goals are arranged according to five general areas: the library and the campus network, library workstation access and networking, the relationship between local and other bibliographic systems, funding, and staff expertise and training. A selected bibliography is arranged according to the sections of the paper.

LIBRARY LOCAL AREA NETWORKS

Any library which uses more than a few microcomputers within one building or a cluster of buildings may benefit by interconnecting these microcomputers and associated peripheral equipment such as printers by means of a local area network, or LAN. A library LAN might link together only workstations used by staff or only those used by patrons, or it might link together both types of workstations. Uses for a library LAN include:

- Electronic mail
- Sharing data or software among several workstations
- Sharing access to expensive peripheral equipment such as laser printers among several workstations
- Providing access to other networks and remote computer systems
- Providing access to mainframe- or minicomputer-based library systems such as an online catalog

A LAN can be simply defined as ". . . a communications network that provides interconnection of a variety of data communicating devices within a small area" *(Stallings, P. 2)*. It is important to note that not all computer systems operating over small areas are local area networks. To take a common instance, an online catalog system in which multiple terminals are directly connected to one large central computer is not a LAN, even if the entire system in contained within a single building; it is simply a timesharing computer system. Such a system is not a LAN because it is not really a network: the terminals communicate with the central computer but not with each other.

If the benefits of the LAN do in fact justify the expenditures, then the library should experience a significant change in the way staff work or the way people use the library.

The decision to implement a LAN has implications beyond the cost of additional hardware, software, cabling, and staff resources. If the benefits of the LAN do in fact justify the expenditures, then the library should experience a significant change in the way staff work or the way people use the library. Library managers must anticipate, evaluate, and manage these changes.

The Mann Library at Cornell University and the University Library at the University of California, San Diego are two research libraries which have installed LAN's over the last few years. The experience of these libraries in planning, installing, maintaining, and using their LANs is examined in this section.

Case Studies

Cornell University (Mann Library)

NOTE: The following description of the selection and installation of a LAN at Mann Library follows closely Gwen Urey's presentation on "Installing a Local Area Network in a Public Access Microcomputer Center" at SCIL 88 (the Third Annual Small Computers in Libraries Conference), held March 7-9, 1988, in Chicago, Illinois. For a summary of this presentation see *Urey*.

The Microcomputer Center at Cornell University's Mann Library provides faculty, staff, and students with access to a variety of microcomputer software and hardware. Users may use their own software on one of the center's public access microcomputers (21 IBM PC's, 7 IBM PS/2 Model 50's, 5 Apple MacIntosh Pluses, 2 Mac SE's, and 2 Mac II's) or they may use any of the center's more than 200 software titles. Faculty place software and data on reserve and use the center to conduct workshops and course sections. Library staff also conduct a variety of workshops, training sessions, and course sections at the center on topics such as online database searching and management of reprint files. The center's staff includes one full-time manager and 20 to 30 student operators. For a detailed discussion of the center see *Curtis*.

In the spring of 1987, a planning group consisting of the center's manager, the head of the library's Information Technology Section, and several public service librarians began planning for a LAN to be installed the following fall semester. The immediate expected benefits included:

1. Streamlining the circulation of popular software packages by eliminating the need for patrons to check out program disks.
2. Making software packages more convenient to use by eliminating the need for patrons to manipulate multiple program disks.
3. Reducing the risk of damage to circulating programs by eliminating the need to physically circulate the software.

Longer-range goals included allowing center workstations to share CD-ROM databases and to gain access to remote networks and computer resources, such as the library's mainframe-based online catalog and national scholarly networks.

The planning group first spent time learning about LAN technology, including the differences in speed, function, and price among LANs currently on the market. Next, the group drew up a list of desired LAN features. In creating this list, the group included capabilities which represented an improvement over the current setup and insured that patrons would feel no loss of convenience in using the center.

As expected, none of the available systems fulfilled all items on the wish list.

The list of desired features was translated into bid specifications. Bids varied widely in both price and function. As expected, none of the available systems fulfilled all items on the wish list. The library decided to purchase hardware from one vendor, software and consulting from another, and installation services from a third. The system purchased was an Ethernet LAN running Novell Software. Costs for hardware, software, cabling, and consulting to interconnect 30 IBM PC's and one IBM AT—the network server—came to $16,800. Network versions were initially purchased for two popular software packages, WordPerfect and Minitab, at a cost of $1,600, bringing the total initial investment to $18,000. New York State grant funds awarded to the library for this project covered most of the initial costs. This total does not include the cost of the network server, an IBM AT with 3.5 MB RAM and 142 MB hard disk storage, which was needed to run the main network control software and to provide storage for the applications programs and data to be shared on the network. This microcomputer was transferred from another library department, and will eventually need to be returned. The cost of a replacement server is expected to be around $12,000.

The center's LAN has been in operation since October 1987. Six of the most popular software packages are circulated through the network, along with software placed on reserve by faculty. The US Census Bureau's 1983 *County and City Data Book* is also available on the network, with a search and retrieval interface written by a public services staff member.

Most of the desired features on the planning group's wish list have been implemented. These include:

1. Support 35 simultaneous users, 20 of whom might be using WordPerfect simultaneously
2. Easy backup of software
3. Strong user interface
4. Capability of connecting more workstations
5. Clear documentation
6. Generation of daily software usage statistics
7. Potential to link to external resources—the library's mainframe-based online catalog, national scholarly networks, and so forth.
8. Support for shared access to CD-ROM databases

In fact, only two of the desired features on the planning groups's original list are not yet available. Most significant is the inability of the current network to connect to the center's 9 Apple MacIntosh microcomputers. However, it is hoped that a recently announced upgrade to the Novell software will allow the Macs to be connected. The current system also lacks a built-in network capability for limiting users to the use of particular

software packages only. This is not seen as a big problem, however, since there are other options to control user access.

The center manager spends about 2 hours/week on the various tasks required to maintain the network, with an additional 10 to 12 hours/week of student help required. Other ongoing costs include network hardware and cabling maintenance, network control software upgrades, and upgrades for the software made available through the network.

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In November 1986, the University Library at the University of California, San Diego (UCSD) began the phased implementation of a Novell/Ethernet LAN designed initially to link together administrative and systems workstations within the Central University Library (CUL) building. By June 1987, the library LAN encompassed all staff in library administration, the library personnel office, and four staff members in library systems. The network included 15 workstations, 2 fileservers, and a number of networked printers. Dial-up access to the LAN was also supported.

The Novell/Ethernet configuration was chosen in part for its flexible upgrade path, and in June 1987, the library administration approved a plan to expand the network to include all 16 department heads plus 9 administrative assistants. This expansion involved not only the extension of the LAN within the CUL but the installation of additional segments in four branch libraries. The expansion was completed during the fall of 1987 for close to the budgeted cost of $40,000. The main costs included $5,600 for hardware and software for an additional fileserver, $8,200 for ten additional workstations for administrative staff, $8,100 for 25 network interface cards (NICs), and $14,300 for 5 buffered Ethernet repeaters needed to allow the five geographically separated segments of the library network (the CUL and four branches) to communicate via the campus network.

Ongoing costs associated with the LAN are an estimated $3,500/year for hardware and software maintenance including upgrades, $6,000/year in service charges for each of the five buffered Ethernet repeaters needed to connect the library LAN with the campus LAN, and $1,500/year in leasing charges for two laser printers.

It is important to note that these cost figures do not include the considerable staff resources required to plan, implement, and maintain the LAN. Existing library systems staff have carried out all of the technical planning for the LAN expansion, including installation of additional hardware, software, and cabling, as well as maintenance, upgrades, and troubleshooting.

The main reason for the expansion of the library LAN was to increase the productivity of the library's managers . . .

The main reason for the expansion of the library LAN was to increase the productivity of the library's managers, based on a perception of the significantly increased productivity of participants in the first phase of the Ethernet implementation. LAN users have noted dramatic time savings by using electronic mail in place of traditional telephone tag. By allowing essentially instantaneous transmission and reducing the need for hard copies of documents, the LAN also facilitates the wide distribution of agendas, memos, proposals, budgets, and other information that characterizes the open management style of the UCSD Library.

Library managers have noted a number of other benefits of LAN implementation. The installation of heavily used applications software on LAN fileservers has eliminated the need to purchase and upgrade multiple copies of this software. Although the cost of acquiring and upgrading the network version of a software package is typically much higher than the cost to purchase and upgrade one single-user copy, the library has enough users to make the network version more economical for many applications. It is also far less time consuming to upgrade one network copy than many individual copies. Maintaining the software on the LAN also makes it

much more difficult to make unauthorized copies of software, supporting the library's stringent policy against software piracy.

As a result of the expansion and enhancement of the library LAN, library staff now communicate with other units on campus via the campus network; staff currently use the network to communicate with the university personnel office and business services. The campus network also supports gateways to other networks and a modem pool which allows network users to dial out to any external network. Library staff use these capabilities for online searching, external e-mail, access to MELVYL (the union online public access catalog which includes the holdings of all of the University of California system libraries), and access to other remote databases and networks.

The library LAN is also expected to play a role in supporting user access to both MELVYL and the library's local Innopac online catalog, which is to be implemented soon. Branch library MELVYL terminals are currently connected to the MELVYL system via the campus network, a service for which the library is charged; it is hoped that these terminal connections eventually can be supported instead by the library LAN, with a cost savings of around $20,000 per year. Similarly, it is planned that some Innopac terminals will be connected to the CUL minicomputer via the library LAN.

It is planned to continue the expansion of the library network as the budget allows. Since the LAN-based e-mail system has become central to library communication, all UCSD librarians have now been assigned addresses on the system, even if some of them must share workstations. Library systems staff have estimated the cost of expanding the network to be approximately $110,000. This includes 37 additional microcomputers to provide remaining librarians with workstations, an additional file server, and additional shared printers.

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Observations and Conclusions

1. Successful LAN planning and budgeting is based on an understanding of the role that the LAN will play in a library's operations.

Because each library has different reasons for setting up a LAN, library LANs will differ in their functions; in their hardware, software, and cabling; in their relationship to the campus network; and in their one-time and continuing costs. The goal of LAN implementation at Cornell's Mann Library was to enhance the operation of a public access microcomputer center, whereas the main motivation at the UCSD Library was to increase the productivity of library managers. The different needs addressed by the two networks are reflected in their different configurations and in their diferent types of costs.

These differences are illustrated in the contrasting relationships of these two LANs to the campus network. The establishment of a link to the campus network is a long-range goal of LAN implementation at Mann Library, with the primary initial goal being to interconnect a group of workstations in a single building. At UCSD, the objective of linking library managers in different campus buildings required the use of the campus network to connect the segments of the library LAN. This involved the purchase of special repeaters for each of the five LAN segments at UCSD at a cost of $14,300, along with service charges of $6,000/year.

2. *In addition to linking workstations internally, library LANs can enhance staff productivity and provide wider service to users by linking library workstations with the campus network.*

Access to the campus network is seen by library managers as one of the main benefits of the UCSD library LAN. From any library LAN workstation, staff can communicate with other units on campus, perform online searches, search the University of California union online catalog, use external electronic mail networks, and use campus network gateways or dial-out capabilities to gain access to any number of other networks and remote systems. Cornell eventually plans to link the Mann Library LAN to the campus network, providing Microcomputer Center users with access to the library online catalog as well as other resources.

3. *Specialized knowledge and skills are needed to plan, install, and maintain a LAN.*

At Mann Library a group of library staff members studied LAN technology in preparation for the specification and implementation of the LAN, and eventually purchased both consulting and installation services from outside vendors. At USCD the library administration relied on library systems staff for LAN planning and installation. While they took different approaches, both libraries recognized the need for specialized knowledge and skills *(see also Miller).*

THE LIBRARY AND THE CAMPUS NETWORK

More and more universities are building institution-wide data communications networks to improve access to campus computing resources and to provide researchers with gateways to national and international computer networks. At some universities these networks support video as well as data transmission; at other institutions separate video networks are being installed. While voice communications in universities, as in most large organizations, are still typically carried on a separate network from data and video transmission, the computer and telecommunications industries appear to be moving steadily toward the integration of voice, data, and video transmission. See *Miller* for a discussion of this integration.

The library can vastly increase the usefulness of the network to the university community.

Academic and research libraries are in a unique position to influence and be influenced by campus networks. The library can vastly increase the usefulness of the network to the university community. In addition to supporting remote access to the library's online catalog, the institutional network can serve as the foundation for a range of innovative library services, such as access to various databases maintained by the library, electronic distribution of new acquisitions lists, and reference assistance by electronic mail.

Given libraries' immense potential contribution to campus networks, and these networks' critical impact on library operations, one might expect academic and research libraries to be centrally involved in campus network planning and development. In reality, however, libraries appear to be on the periphery of university telecommunications policy-making. See *Flower* for a detailed discussion of the library's role.

This section describes the campus network integration experiences of libraries at Brown, Johns Hopkins, and Vanderbilt, with an emphasis on the library's role in network planning. Network access to the library's online catalog and other library services and the role of the network in providing library staff with access to campus resources, external networks and online databases are also topics of discussion.

Case Studies

Brown University

Brown University computing resources, video transmission and receiving facilities, and departmental workstations are interconnected through a campus-wide network called Brunet. The network is managed by the vice-president for computing, who reports to the provost. The campus telephone system is managed separately from Brunet, and there are no current plans to integrate voice communication with data and video.

Users may access the network either by dialing up or through dedicated network connections. Individual units on campus must pay the computing center a one-time charge of $1,100 for each two network connections. Each network connection may support a single workstation, or it may serve to link departmental local area networks to Brunet, thereby providing shared network access to several workstations.

The library at Brown has been connected to Brunet for several years. Brunet connects the library's online catalog terminals to the host computer located at the computing center. Library staff go through the campus network to use Brown's mainframe-based word processing system and high-quality laser printer, to transfer files between library microcomputers, and for electronic mail. Approximately 90% of the library's microcomputers are connected to the network.

Library staff use Brunet to gain access to external systems such as RLIN. Brunet also supports a dial-out capability through which any network terminal can connect by modem to other online systems and networks. Library staff use this network capability for a small but significant proportion of dial-up access to remote systems. However, this method of connecting to remote systems is perceived by most staff as somewhat awkward, and most online searching is done using microcomputer workstations equipped with modems.

The library recently has taken over responsibility for Brown's media services unit, which was previously managed by the computing center. Video recordings are distributed via Brunet from media services to various departments on campus.

The need to provide access to the library's holdings through Brunet has played a central role in the selection and implementation of an online catalog at Brown. A primary criterion in the selection of a system was that any network terminal be able to access the catalog.

A key assumption in the planning for Brown's online catalog has been that most searches will be conducted from outside the library.

In fact, a key assumption in the planning for Brown's online catalog has been that most catalog searches will be conducted from outside the library. At least one major online system was ruled out due to inability to guarantee this capability. A major challenge in implementing the online catalog has been the need to maintain appropriate levels of password security for library staff while at the same time allowing broad network access to the catalog.

The computerization of the Brown University campus received a major push from the Scholar's Workstation Project. The goal of this project was "to experiment with, shape, and evaluate new types of computer and communication tools that might have a profound effect on future education and scholarship" *(Moran et al, p. 6)*. While this project has had a significant impact on the library at Brown, it is important to note that the library's online catalog implementation, while designed to complement the Scholar's Workstation Project, was funded and administered separately. See *Moran et al* for detailed discussion. Brown received a grant of 1.5 million dollars from the Pew Memorial Trust for "An Online Catalog in the Context of a Network of Scholar's Workstations." The project proposal set forth three goals *(Taylor, p. 1)*:

- To provide access to an on-line catalog of bibliographic information about library holdings.
- To provide access to outside bibliographic databases such as the Research Libraries Information Network
- To serve as a central information resource for the Network of Scholar's Workstations and to monitor the effects of the local area network environment on the traditional role of the academic research library

Perhaps the strongest link between the two projects has been the central role of the campus-wide network in each: scholars use their workstations to gain access to a variety of resources through the network, one of the most significant of which is the library catalog.

Responsibility for planning and management of both Brunet and the central computing resources at Brown are centralized in the position of vice-president for computing (VPC). While the library is not represented on the faculty advisory committee which advises the VPC, it does appear that the library has significant input to computing and network decision-making. The university librarian, who along with the VPC reports to the provost, has had a major role in planning for the Scholar's Workstation Project. The university librarian and library systems/planning officer work closely with the computing center management to manage the online catalog.

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Johns Hopkins University

Johns Hopkins University (JHU) is in the midst of implementing a comprehensive campus-wide networking strategy. Data, voice, and video transmission will be supported by separate networks. A campus-wide backbone network located on the main Homewood campus will link a series of primarily discipline-based networks and subnetworks for data transmission to each other as well as to external resources. In such a configuration the backbone portion of the network serves to connect local area networks with one another, with campus computing resources, and with external networks. Workstations are not typically attached directly to the backbone but are linked to it via smaller local area networks. Dial-up access to the network is also supported. Major support for the data network implementation has come from the Digital Equipment Corporation (DEC), which is supporting the JHU network in part as a demonstration project.

The College of Engineering was the primary architect of this networking strategy and continues to play a prominent role in ongoing network development and planning. Ongoing management of the network is the responsibility of the Homewood Computing Facilities, the central computing center at JHU, whose director has reporting lines to both the dean of the College of Engineering and the provost.

In January 1985, several months after the JHU network proposal had been submitted to DEC, a Homewood Networking Committee was established and charged with defining requirements for computer networking on the Homewood campus. The committee was chaired by the dean of the College of Engineering and made up of representatives of departments housed on the central campus, including the director of the Milton S. Eisenhower Library. The director of the Homewood Computing Facilities was also a member of this committee. The main activity of the committee was to clarify the network strategy to the departmental representatives.

Until recently, no library workstations were connected directly to the campus-wide network. The need for library staff to use any computing or communications resource on the campus network was rare enough that dial-up access to the network was sufficient. The campus network is not linked to Tymnet or Telenet, the primary public data networks used for online searching, and does not support any dial-out capability. The library has no local area network to be connected to the campus network, and there are no plans to install a LAN.

However, due to a dramatic expansion in fund-raising activity, a number of workstations recently have been linked via the campus network to a mainframe-based fund-raising database management system developed for the library by the campus computer center. The library switched from a small microcomputer-based fund-raising database to the more powerful system to support an effort to raise $4,000,000 to match a National Endowment for the Humanities Challenge Grant of $1,000,000.

The library online catalog is accessible from any network terminal and to dial access network users.

The library is implementing a NOTIS-based online catalog. Library terminals are connected directly to a separate host computer housed at the central computing facility. While the library computer is linked indirectly to the campus network, both staff and public access library terminals provide access only to the online catalog. The library online catalog is accessible from any network terminal and to dial access network users.

It is interesting to note that network access to the online catalog, while a priority for the library, is not emphasized or even specifically mentioned in the most widely distributed formal description of JHU's networking strategy *(An Overview of Academic Computing and Networking at the Johns Hopkins University)*.

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Vanderbilt University

Vanderbilt is installing a campus-wide backbone network called Caravan. This network will be used for both data communications and video transmission. Although the university office of telecommunications has installed a digital telephone system that allows access to Caravan, there are no current plans to integrate voice communications with data and video. Caravan is managed by the university's computer center.

In addition to the link via the digital phone system, dial-up access from standard phone systems is supported, as well as direct access via departmental networks. Departmental networks are connected to the backbone network via "bridges" which are installed and maintained by the university's computer center. A department may install and maintain its own local network up to the bridge connection, or it may contract with the computer center to install and maintain a local network. The computer center must approve any departmental system which is linked through a bridge to Caravan. The annual combined charge for bridge maintenance and backbone network service is $4,800. The annual cost to lease a bridge is $3,400; a bridge also may be purchased for $14,000.

The library's NOTIS-based online catalog, called Acorn, runs on a separate library computer housed in the computer center. While most of the library's 200 terminals are connected directly to the library computer, about thirty public access workstations are connected via the Caravan network. Dial-up access to the library system also is supported. While access to the library catalog is supported for most workstations linked to Caravan, some workstations which use particular communications protocols cannot yet connect to the catalog. The library and computer center are working to solve this problem.

To date, library staff have had little need for Caravan access. Very few staff workstations are connected via bridges to the network. Staff use an e-mail system supported on the library computer. While Caravan supports a link to Bitnet, it does not support links to the primary public data networks used for online searching (Tymnet and Telenet) and does not support a general dial-out capability. However, the library is interested in both of these capabilities and both are planned. Apart from short Ethernet segments installed primarily to connect the library's Caravan-based online catalog terminals to the campus network and one small administrative network, there are no LANs installed in the library and no immediate plans for additional LAN installation.

With the support of the Pew Charitable Trusts, the library has been exploring the use of the campus network to offer a variety of additional information resources to its users. The library has been working with NOTIS to integrate MEDLINE and other citation databases into the online catalog. The possibility of linking library CD-ROM workstations to the network is being explored. The library also is looking at the possibility of providing local access to various databases using the BRS/SEARCH database management system, described below in the University of Pennsylvania Libraries case study. In a new service called TeleVU, the campus network is being used for video transmission—including local and satellite television channels and course-related video tapes—from the general library building to other campus units, including 1,000 dormitory rooms. The library also has recently begun making lists of newly-cataloged titles available to Caravan users.

In terms of involvement, Vanderbilt is a rare example of a research library that is at the center of network planning and development.

In terms of involvement in network planning and development, Vanderbilt is a rare example of a research library that is at the center of network planning and development. Both the computer center and Heard Library report to the associate provost for information services and technology/director of libraries, who has primary responsibility for the library and the campus data network.

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Observations and Conclusions

1. *Unlike most units within the university, the library both uses the campus network and provides services to network users.*

In this sense the library indeed resembles the campus computer center; in fact, it can be argued that the library's online catalog is at least as valuable a network resource as the campus computing facility. Library managers must take into account the library's dual role as user and service provider to effectively manage the library's integration into the campus network.

2. *Library users increasingly are coming to assume that the library catalog will be accessible via the campus network.*

It seems that at any university with both a campus-wide data communications network and an online library catalog, network access to the library catalog emerges as a priority.

3. *Libraries are exploring ways in which campus networks may be used to provide innovative services to users.*

As library users become accustomed to using one library information resource—the library catalog—via the campus network, it is logical that they will begin to demand network access to other types of information as well. As the Vanderbilt experience illustrates, providing network access to citation databases through CD-ROMs linked to the network, additional files supported by the online catalog, and/or database management software such as BRS/SEARCH is a high priority.

LINKS AND COMMON INTERFACES FOR BIBLIOGRAPHIC SYSTEMS

The inefficiency and frustration associated with the use of many dissimilar, unconnected online bibliographic systems are familiar problems to most academic and research library staff and users. Such systems include local online library systems, national bibliographic/resource-sharing networks, and remote online databases. These systems typically are not interconnected, and the user interface varies widely among systems. Users constantly log off one system and on to another, and various systems produce tapes of bibliographic records to load into another. Users frequently must switch gears and use different protocols as they search for similar types of information on different systems.

There is increasing interest among the library community in two approaches to alleviate the problems involved in using dissimilar systems. One approach is to establish direct telecommunications-based links between systems. Such links are expected to speed up and streamline the transfer of bibliographic and authority records, allowing libraries to develop more efficient and productive technical services workflows. Libraries already have experienced the more timely availability of Library of Congress authority records in RLIN and OCLC due to the direct transfer of records from LC to these networks as part of the Linked Systems Project *(see Denenberg* and *Fenly and Wiggins)*. In the future, hopefully, direct links will support intersystem searching. For example, a search of a library's local catalog could be expanded transparently to the user to one of the national online databases. The New York University Libraries' efforts to establish a direct link between RLIN and NYU's local GEAC system are discussed in this section.

An alternative approach is to establish a common interface to dissimilar systems. In this approach, the user interacts with an intermediary front-end system which translates a user's search into the native command language of each bibliographic system, transmits the search to one or more of these systems, receives response, and translates the results into a standard display for the user.

Two common interface projects are discussed in this section. The University of Southern Colorado Library is working to establish a link between the library's local Dynix system and the Irving Library Network, a network of Colorado libraries supporting shared access to member online catalogs. The Florida International University (FIU) Libraries, a member of the Southeast Florida Library Information Network (SEFLIN), is participating in the SEFLINK project to provide shared access to several SEFLIN member library online catalogs, including FIU's NOTIS system.

Case Studies

New York University Libraries

The New York University Libraries (NYU) have been working with RLIN and GEAC since 1986 to develop a link between NYU's GEAC library system and the RLIN network. Their approach is based on a commitment to use the Linked Systems Project/Standard Network Interconnection (LSP/SNI) protocols, a specific implementation of the international Open Systems Interconnection model for linking computer systems. To date, activity on LSP/SNI-based linking of systems has focused on authority record transfer between the Library of Congress, RLIN, and OCLC. While many local system vendors have expressed interest in developing LSP/SNI-based links with other systems, GEAC, in cooperation with NYUL and RLIN, is the first vendor to have actually reached the testing stage. For an overview of the LSP/SNI protocols, see *Denenberg.*

At the outset of the project, NYU, RLIN, and GEAC established a three-stage plan for linking NYU's GEAC system with RLIN: 1) transfer of bibliographic records from RLIN to GEAC; 2) transfer of bibliographic records from GEAC to RLIN; and 3) transparent searching of RLIN through GEAC terminals using standard GEAC searching protocols. Stage one is now well into the testing phase, and it is hoped that RLIN-to-GEAC record transfer will be in routine production by the

fall of 1988. Once bibliographic record transfer is in production, work is expected to begin on the transfer of authority records from RLIN to GEAC.

NYU expects to see benefits at each stage of the project. The libraries do all current cataloging and catalog maintenance on RLIN and load new and revised RLIN records into GEAC by tape. As now envisioned, the direct RLIN-to-GEAC record transfer to be implemented in Stage 1 eventually will replace tape loading, decreasing the time it takes for the new cataloging and catalog maintenance done on RLIN to be reflected in NYU's local online catalog from 7-10 days to 1 day.

NYU, RLG, and GEAC staff have devoted attention to the optimization of NYU workflows to take advantage of the direct two-way record transfer to be supported in Stage 2. Once GEAC-to-RLIN transfer is available, library staff plan to do only derived cataloging on RLIN and will create original records and do all catalog maintenance on GEAC. Original and revised records will then be transferred to RLIN via the LSP/SNI link. The staff expects this change to streamline NYU cataloging workflows while honoring the libraries' commitment to adding and maintaining records in the national database. The GEAC-to-RLIN link also will facilitate the incorporation of a large group of REMARC retrospective records into RLIN by allowing them to be transferred directly from GEAC to RLIN.

Stage 3, transparent RLIN searching using GEAC terminals and standard GEAC searching protocols, is designed to benefit both library staff and users. There is demand among NYU users for access to the RLIN database, which in Stage 3 will be available via the same terminals and user interface as the library's online catalog. This integration also will move NYU toward the goal of providing access to as many diverse systems as possible through each library staff workstation.

NYU staff reports that the project has resulted in some indirect benefits. The expected increase in the speed of RLIN-to-GEAC record transfer in Stage 1 of the project has motivated them to explore options for speeding up processing to ensure that items are in fact available as soon as their records are added to the online catalog. The ability to move specific RLIN records quickly into NYU's GEAC system also has facilitated testing of new GEAC record-loading software.

While NYU has devoted some resources to the development of the GEAC-RLIN link, the costs to the library have not been burdensome. Funding from the Pew Foundation supported the purchase of a new GEAC 9000 computer capable of supporting the LSP protocols. RLG and GEAC are absorbing the costs of software development for the project. NYU now pays approximately $1,300/month for a dedicated telecommunications line to support the link, but this line will soon no longer be needed due to the transfer of the LSP/SNI link to RLG's newly-installed data network.

NYU has experienced both the advantages and frustrations of . . . a pioneering linking project.

NYU has experienced both the advantages and frustrations of being involved in a pioneering linking project. On the positive side, NYU expects to be the first library to realize the considerable benefits of direct network-to-local system record transfer. NYU has had an important voice in determining the overall approach and in influencing many of the specific decisions related to the way records will be transferred between RLIN and local systems.

Being a pioneer also has its frustrations. Work on the RLIN-GEAC link began before some of the international standards upon which LSP is based had been finalized. Therefore, a certain amount of backtracking was required in order to incorporate new standards as they were adopted. There have also been some delays because LSP/SNI-based communications capability is still, for GEAC, a software development project rather than a standard product feature. At one point during LSP/SNI development, NYU implemented a new release of the GEAC system only to find it no longer supported the LSP/SNI communications capability. Finally, as the pioneering GEAC-LSP/SNI installation, NYU has had to bear the burden of extensive testing.

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University of Southern Colorado Libraries

The University of Southern Colorado Library (USCL) is participating along with three Colorado public libraries (Adams County, Douglas County, and Englewood Public Libraries) in an LSCA-funded project to integrate their four Dynix online catalogs into the Irving Library Network (ILN). This network currently provides access through a common network interface to the online catalogs of six public library systems (Aurora, Boulder, Broomfield, Louisville, Denver, and Jefferson County), and, through Denver Public's participation in the Colorado Alliance of Research Libraries (CARL), to five academic library online catalogs (Auraria Library, Colorado School of Mines, and the Universities of Colorado, Denver, and Northern Colorado). For an overview of the Irving Library Network, see *Luce* (1986) and *Luce* (1984).

NOTE: USCL was selected as an Irving Library Network case study because it is the only academic library with full membership in the ILN. The five academic library online catalogs are available through the ILN only because Denver Public belongs to both the ILN and CARL. None of these five academic libraries are actually ILN members. They do not have ILN terminals and they do not have reciprocal borrowing agreements with all of the ILN members.

The same ILN commands are used to search each catalog, and users may repeat their searches in different catalogs.

Access to each ILN online catalog is provided through special network terminals installed at each member library. The network also supports dial-up access. Users select the library catalog they want to search from a menu screen. An ILN search retrieves bibliographic, holdings, and circulation status information from the selected online catalog. The same ILN commands are used to search each catalog, and users may repeat their searches in different catalogs. The ILN also serves as an online ILL network for member libraries.

The ILN is organized technically and administratively around five nodes, each of which corresponds to one of the diverse local systems connected to the network. These nodes are Aurora (the CLSI node), Boulder (the Eyring Library Systems node), Denver (the CARL node), Jefferson County (the Unisys/Pueblo node), and the Dynix libraries (Dynix node). The ILN board of directors includes one representative from each node, plus the project director. The Dynix libraries have selected the director of USCL as the Dynix node board member.

Participants expect that ILN membership will facilitate cooperative collection development . . .

USCL anticipates significant benefits through ILN membership. Users will be able to locate materials not available on site. Through reciprocal borrowing arrangements, USCL staff will be able to use the ILN to send online ILL requests to other members. In fact, establishment of reciprocal borrowing agreements with the other members is a condition of ILN membership. Participants expect that ILN membership will facilitate cooperative collection development, particularly in the context of a developing statewide effort in this area. The network also will provide USCL with an electronic mail link with other ILN members.

Due to the availability of LSCA funds to support initial software development and hardware purchase and installation costs, USCL's start-up costs for participation in the ILN are expected to be minimal. USCL and the three other participating Dynix libraries received approximately $50,000 in LSCA funds to support the development of the software to link their online catalogs to the

ILN. This software already has been developed and tested. The four Dynix libraries have been awarded an additional $65,000 for the purchase and installation of the hardware and communications lines necessary to link them to the ILN. Ongoing hardware and software maintenance and telecommunications costs will be included in USCL's $4,000/year ILN membership fee.

While membership in the ILN is not expected to require any great financial commitment from USCL either one-time or ongoing, the library has spent time to establish close cooperative relationships with the ILN itself, with the three other participating Dynix libraries, and with Minicomputer Systems, Inc., the vendor which has developed and maintains the ILN software. Membership in the ILN also has expanded USCL's reciprocal borrowing commitments to include all ILN members.

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Florida International University Libraries

The libraries of Florida International University (FIU) participate in the Southeast Florida Library Information Network (SEFLIN), an 11-member multitype library network established in 1984 to improve library service to the residents of southeast Florida. The other members of SEFLIN are the Florida Atlantic University (FAU) Libraries, the University of Miami Libraries, Broward Community College Library, Broward County Library, Miami-Dade Community College Library, Miami-Dade Public Library, the Law Library at Nova University, the St. Thomas University Library, the Barry University Library, and Palm Beach Public Library System. SEFLIN is governed by a board of directors, one from each participating institution, and administered by an executive director. The network was supported initially with LSCA Title III funds. SEFLIN incorporated in April 1988, and became member-funded the following October. SEFLIN's planned 1988-89 budget is $210,000.

SEFLIN's first project and the initial goal of the member libraries was the establishment of a telefacsimile and courier network to improve interlibrary loan service among southeast Florida libraries. The next major SEFLIN project was the production of a union list of serials. The first edition of the union list was produced in microfiche. The second edition in August 1988 was distributed in CD-ROM format. This CD-ROM product eventually may expand to include monographs and function as a complete union catalog of SEFLIN library holdings. SEFLIN member libraries also provide one another with free ILL photocopies.

One of the motivations in the founding of SEFLIN was the hope that the network would eventually support the development of interfaces between the various online catalogs of the participating libraries. In August, 1987, the State Library of Florida made available LSCA funds to accomplish this goal. SEFLIN has contracted with Minicomputer Systems, developer of the Irving Library Network software (described above in the University of Southern Colorado Library case study), to develop similar software to support the SEFLINK online network.

In the first phase of the project, SEFLINK will provide access to the online catalogs of four of the SEFLIN libraries: FIU and FAU, which together with the seven other Florida public universities use the NOTIS online catalog, supported by the Florida Center for Library Automation; Broward County Public Library, which has the Utlas online catalog; and Miami-Dade Public Library, which has the GEAC online catalog. Twenty dedicated SEFLINK terminals will be distributed among the four Phase I libraries, and four dial-in ports also will be made available.

The planned design for SEFLINK is similar to the Irving network (USCL case study). Users will select the catalog they want to search from a menu screen. A SEFLINK search will retrieve bibliographic and holdings information. The same SEFLINK commands will be used to search each catalog, and users will be able to repeat their searches in different catalogs. SEFLINK also will serve as an online ILL network for SEFLIN libraries whose catalogs are available through the system.

Initial software development, software licensing, hardware acquisition, and telecommunications line installation costs for SEFLINK are expected to be around $250,000, for which LSCA funds are available. Total annual operating and maintenance costs are estimated at around $20,000, to be shared among the SEFLINK participants. FIU's share is expected to be approximately $5,000.

. . . participants believe there has been a significant increase in the efficiency of resource-sharing since they began sharing holdings information . . .

FIU and the other SEFLIN participants believe there has been a significant increase in the efficiency of resource-sharing since they began sharing holdings information with other area libraries through the union list of serials. Telefacsimile and courier document delivery services greatly decrease turnaround time, and the eventual use of SEFLINK is expected to increase efficiency. FIU draws students from all of southeast Florida to its two Miami campuses. In addition, FIU's academic programs are expanding faster than the FIU library materials budget. In the view of the FIU library administration, SEFLIN membership allows the FIU libraries to provide their users with access to a much broader range of materials than could be acquired by FIU alone, through a mechanism which is more efficient and convenient to users than traditional approaches to ILL. Current SEFLIN services are seen as well worth the cost of membership—approximately $21,000 for 1988-89—and the benefits of SEFLINK participation likewise are expected to justify the anticipated annual cost to FIU of $5,000.

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Observations and Conclusions

1. This is the era of pioneering linking and common interface projects.

Despite the great interest in links and common interfaces among dissimilar bibliographic systems and the high visibility of some projects such as Linked Systems and Irving, only a few actually have been undertaken. Libraries which decide to explore links and common interfaces at this time must play the role of pioneer, with all of the advantages and disadvantages involved. This point is illustrated in particular by the experience of NYU, embarking on the first local system-national network link.

2. Links and common interfaces are expensive to develop.

The hardware, communications lines, software development effort, and library staff expertise required to develop and establish system links and common interfaces are expensive. This does not mean, however, that the library itself must bear all or even most of the costs, as illustrated by experiences of all three case study libraries. Not only are grant funds available, but, especially during the early stages of bibliographic system linking and common interface development, local system vendors, networks, and other online system providers may be willing to absorb the cost of software development.

3. A key factor in successful linking and common interface projects is the establishment and maintenance of close working relationships among the participants.

As illustrated by the experiences of the case study libraries, there typically will be a number of participants with which the library must work closely (local system vendors, network software vendors, and so on). If a linking or common interface project is to succeed, necessary working relationships among participants must be established and maintained.

4. *A clear understanding of the rationale for establishing links or common interfaces between systems contributes to the success of a project.*

An important factor in the success of the projects undertaken by both NYU and USCL has been an understanding on the part of each library of the new capabilities the link will support. This understanding ensures that resources are used efficiently, that progress can be evaluated rationally, and that library staff and users realize the purpose of the project.

5. *Common interfaces to local library systems may serve as the foundation for the establishment of a local or regional library network, or a common interface may be developed to meet the needs of an established network.*

USCL's participation in the Irving Library Network is based on the expansion of the ILN (the actual computer network) to include USCL's online catalog and network terminals located at the library. In contrast, FIU's participation in SEFLINK is only one aspect of the libraries' ongoing participation in SEFLIN.

ALTERNATIVES TO REMOTE ACCESS

Telecommunications technology is used heavily in virtually all academic and research libraries to provide access to a variety of remote online databases. Two types of online access in particular have become central to academic and research library activities:

Access to the national bibliographic/resource-sharing networks in support of cataloging, acquisitions, interlibrary loan, and collection management activities.

Online searching of remote databases of bibliographic citations, numeric data, and full-text material in support of reference services.

A main goal of this study is to explore the decisions that library managers are making related to the use of telecommunications technology. This section is intended to place these decisions in a broader context by exploring how alternatives to remote access to online databases are being used to complement traditional online reference searching.

This section . . . explores how alternatives to remote access are used to complement traditional online searching.

More and more databases are now available on CD-ROM as well as online and/or in print, and many academic and research libraries have acquired CD-ROM workstations and databases for the use of patrons and staff. The experience of Texas A&M's Sterling C. Evans Library in setting up and managing a large public access CD-ROM installation is discussed below, with a focus on how CD-ROM databases are used in conjunction with online searching.

It is also possible to acquire data on tape and then use local hardware, software, and telecommunications resources to make this data available to library staff and users. Several academic and research libraries are using the BRS/SEARCH database management software to provide this type of data access. See *Georgia Tech Wires Campus for PC Access to Library.* The experience of the University of Pennsylvania Libraries in using BRS/SEARCH is discussed below, again with a focus on how local and remote access are used together.

Case Studies

Texas A&M

Plans to introduce CD-ROM-based reference service at the Sterling C. Evans Library at Texas A&M University were expedited by two $100,000 donations which allowed the library to establish the James and Virginia Wiley Laserdisk Service, an extensive public access CD-ROM installation. The service, inaugurated in November 1986, includes 15 microcomputer-based workstations providing access to InfoTrac, BIP Plus, Agricola (SilverPlatter), PsycLIT (SilverPlatter), Visual Dictionary (Facts on File), Dissertation Abstracts, Grolier Electronic Encyclopedia, Science Citation Index, ERIC (SilverPlatter), and the LePac GPO Catalog (Brodart). For a comprehensive discussion of how the service has been established and how it is managed, see *Tucker et al* and *Jackson et al.*

At the Evans Library, CD-ROM databases have been integrated into an environment in which end-user and mediated online searching are well established. Both types of searches are subsidized to some extent. With the exception of ERIC and the LePac GPO Catalog, which are located in the Microtext Department and Documents Division respectively, all of the Wiley workstations were placed next to the cluster of online searching workstations already in place for both end-user and mediated online searches. Responsibility for the Wiley workstations was located with the Automated Information Retrieval Service (AIRS), the unit within the reference division responsible for online searching.

Some of the Wiley workstations eventually may be equipped with modems and phone lines to allow online searching in conjunction with searching of the CD-ROM databases.

Likely candidates are the two Wilsondisc databases, Humanities Index and Applied Science and Technology Index, both of which include online time along with the CD-ROM database subscription.

Subsidized end-user searching began at the Evans Library during the 1983/84 fiscal year as an experiment to test the BRS After Dark service. User response was favorable, and additional search stations and end-user search services such as Knowledge Index and Wilsearch have been added. In fiscal years 1985/86 and 1986/87 the number of end-user searches surpassed the number of mediated searches, which include for-fee searches, free ready reference searches, and one free mediated search per academic year for graduate students engaged in thesis or dissertation research. Patrons pay about half the cost of end-user searches.

Reference staff believe that a reduction in mediated and end-user searching is due to the laserdisk service.

Daily use of all the CD-ROM workstations averages around 150 searches, for a yearly total of approximately 54,000 searches. About 3,000 end-user searches and 2,500 mediated searches are performed annually. Because the Wiley stations are often busy, students often use the end-user online search service instead, even though they must pay for part of the cost of the end-user search. Reference staff believe that a recent reduction in both mediated and end-user searching is due primarily to the introduction of the laserdisk service.

While the $200,000 Wiley donations funded the start-up of the laserdisk service, the library pays the continuing costs. Libraries often add new services for patrons without adding staff. Thus, it is not surprising that the reference division has managed to set up and maintain the laserdisk service without additional staff. While this is due in part to the continued reduction in demand for mediated searches which has freed up about ¾ FTE, Evans Library staff also have found that "... the addition of the Wiley Laserdisk Service put a tremendous and unexpected strain on our staff" *(Tucker et al, p.46)*.

The largest continuing cost by far is for ongoing CD-ROM database subscriptions. The yearly cost to renew all of the current database subscriptions, most of which run through April or May of 1989, would be around $30,000. While it is hoped that additional gift funds may be available, Evans Library staff have begun to plan for the potential impact of ongoing CD-ROM subscription costs on the regular library budget. It is not yet known to what extent the regular library budget can support this cost. Texas A&M is on a two-year budget cycle, and the library budget for the 89/90 and 90/91 fiscal years will be finalized in the spring of 1989. In the event that funding for all of the current subscriptions is not available, the library may cancel some of the less heavily used CD-ROM databases.

One option under consideration is to fund those CD-ROM subscriptions which the library decides to maintain out of the acquisitions budget. Subsidies for end-user and mediated graduate student searches come out of this budget, and it is hoped that the cost of the subsidies will go down as users shift to CD-ROM searching. One strategy being considered to reduce end-user searching costs is to require users to search the CD-ROM database before searching the online equivalent in cases where both are available.

Another way to free up funds for CD-ROM subscriptions would be to cancel some selected print equivalents. Consideration of this option is tied closely to the progress of plans to interconnect the CD-ROM workstations through a local area network. It is expected that use of CD-ROM-based sources by multiple workstations probably would provide about the same access to heavily used sources as is provided by multivolume print equivalents, i.e., the subset of data needed by any particular user is fairly likely to be available at any given time. A pilot project is underway to investigate the feasibility of implementing a LAN.

Other continuing costs are for equipment repair and supplies. Repair costs for the period August 1987 through May 1988 totalled $845, most for repair of microcomputers. Only two laserdisk players were repaired

during this period, at a cost of approximately $100 each. Supplies total over $4,000 per year. The largest expense is for Thinkjet printer cartridges, which cost about $10 each.

The heavily used end-user and CD-ROM searching services have enhanced access to journal citations, and there is increasing demand among faculty for access to this information from their offices via Texas A&M's campus-wide data communications network. One possibility would be to link library CD-ROM stations to this network. However, initial discussions with the computer center and CD-ROM database vendors have been discouraging. Anther option under discussion is the use of the BRS/SEARCH software to load data locally, as discussed below in the University of Pennsylvania case study.

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University of Pennsylvania

Starting in the fall of 1987, the University of Pennsylvania Libraries began providing access through the PennNET campus telecommunications network to data loaded locally on the libraries' computer using the BRS/SEARCH database management software. The libraries have loaded ABI/INFORM and MEDLINE as well as several locally created databases, including an index to University of Pennsylvania publications and an index to a collection of television scripts owned by the Annenberg School.

The BRS/SEARCH databases are available through PennLIN, the libraries' online network, which supports access to the NOTIS-based online catalog as well. However, the two systems are searched separately. Users may search PennLIN from any workstation connected either directly or by dial-up access to the PennNET University-wide network. Users are not charged for the use of PennLIN BRS/SEARCH, but the libraries assign accounts to ensure that only University of Pennsylvania students, faculty, and staff use the service. Users must sign an authorization form in which they agree to follow guidelines.

The decision to establish the service grew out of discussions between the libraries' assistant director for automation and the university vice-provost for computing, with advice from the libraries' Online User's Discussion Group.

The decision to establish the PennLIN BRS/SEARCH service grew out of discussions between the libraries' assistant director for automation and the university vice-provost for computing, with advice from the libraries' Online User's Discussion Group. The vice-provost is providing the libraries with $120,000 over three years, partly to help promote use of the campus network. These funds paid for the purchase of the BRS/SEARCH software for $48,000, which is half the standard price since Penn agreed to be a test site, and for the first few years of software maintenance at $11,000 per year. The purchase of the initial MEDLINE file also was supported with these funds. The initial $10,000 cost for the ABI/INFORM file was paid from the library acquisitions budget, which also will provide funds for continuing costs for this data.

The BRS/SEARCH software was installed on the libraries' com-puter, which was already in place and running Penn's NOTIS-based online catalog. The libraries pay the computer center a flat fee of approximately $150,000 per year to operate and maintain their computer. The libraries have purchased the ABI/INFORM and MEDLINE files directly from the database producers, and systems staff have reformatted them for loading into BRS/SEARCH.

Apart from the establishment of the PennLIN BRS/SEARCH service, the libraries have committed significant resources to making machine-readable reference sources available to users through subsidized end-user and mediated online searching and the acquisition of CD-ROM databases. Most online searching at Penn is subsidized. Users pay $4.00 per half hour of search time, regardless of the database, for both end-user and mediated searches. Searches for users with

grant funds typically are not subsidized. End-user searching is available at special library workstations.

CD-ROM databases include Psych Abstracts, ERIC, Disclosure, Business Indicators, County Statistics, DATEXT, Reader's Guide, Humanities Index, Social Sciences Index, Business Periodicals Index, MEDLINE, and the GPO Monthly Catalog.

In June 1987, Penn received a grant from RLG and the Pew Foundation to compare and evaluate its three approaches to providing users with access to machine-readable information—online searching, CD-ROM, and PennLIN BRS/SEARCH. In addition to supporting the collection of data on how these different services are used, this grant has supported the creation of local databases on PennLIN BRS/SEARCH and the acquisition of additional CD-ROM databases.

Penn's library managers consider a number of factors as they decide which files to acquire for PennLIN BRS/SEARCH. One consideration is a desire to balance the types of files available. Since the current files serve needs primarily in the areas of business (ABI/INFORM) and medicine disciplines (MEDLINE), it is likely that the next file to be added will support the humanities, such as ISI's Arts and Humanities file.

The libraries are striving to maintain a balance between cost-effective and convenient access. Costs associated with acquisition of files for PennLIN BRS/SEARCH include both the purchase price to the vendor as well as the cost of online storage and additional disk drives. In deciding whether to load a particular file into PennLIN BRS/SEARCH, these costs must be compared to the costs of providing access to the same database through online searching and/or CD-ROM workstations. However, the greater convenience for many users of searching a database on PennLIN BRS/SEARCH via the campus network as compared to having to come to the library for online searching or CD-ROM database searching must also be considered. Library staff are investigating the possibility of providing access to CD-ROM databases via PennNET. Should this alternative become feasible, cost considerations may well make the loading of files into BRS/SEARCH less attractive.

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Observations and Conclusions

1. *The challenge that academic and research libraries will face in providing users with access to information is likely to be more a matter of finding the best balance among formats than choosing the "right" format. This balance will need to be constantly re-evaluated as new technologies are introduced and the relative costs of different formats change.*

The theme of balance is apparent at both case study libraries. While users at Texas A&M's Evans Library appear to be moving to some extent away from online searching toward reliance on CD-ROM databases, there will remain much online data not available in CD-ROM format. There are some CD-ROM database vendors such as Wilson who design their products with the intention that users will search both the CD-ROM and online databases. At the University of Pennsylvania Libraries the balance between online, CD-ROM, and BRS/SEARCH use is the subject of a study funded by an RLG/Pew Foundation grant. Decisions at Penn concerning which format to use for a particular database must take into account not only the relative costs of the different options but the greater convenience to many users of the BRS/SEARCH service and the mix of databases currently supported.

2. *Libraries will be facing increasing demand from their users to provide access to information via the campus network.*

The establishment of the PennLIN BRS/SEARCH service at Penn represents a recognition that many users prefer to use the campus network rather than come to the library in their search for information. Library staff at Texas A&M are considering ways to meet faculty demand for access via the campus network, BRS/SEARCH among them.

SUMMARY AND RECOMMENDATIONS

Telecommunications technology is playing an increasing role in academic and research library operations. Local area networks have been implemented to increase staff productivity (as at the University of California, San Diego) and to provide enhanced services to library users (as at Cornell's Mann Library). Universities are investing heavily in campus-wide telecommunications networks which provide access to the library's online catalog as well as other online library services (as at Brown, Johns Hopkins, and Vanderbilt). A few pioneering academic and research libraries have begun to explore the benefits of links and common interfaces for bibliographic systems (as at New York University, the University of Southern Colorado, and Florida International University).

Telecommunications technology in academic and research libraries is changing as managers explore alternative approaches to data access.

The role of telecommunications technology in academic and research libraries also is changing as library managers explore alternative approaches to data access. Advances in optical storage have made it feasible for libraries to provide inhouse, microcomputer-based access to databases that typically have been available only through telecommunications-based links to remote systems (as at Texas A&M). Academic and research libraries also are beginning to expand their role as online database providers beyond the limits of the online catalog, creating yet another alternative to remote database searching (as at the University of Pennsylvania).

The Need for Library Telecommunications Strategies

Academic and research libraries establish overall strategies in those areas which are perceived as critical to the successful fulfillment of the library's mission, such as collection management, staff development, user services, and preservation. The use of telecommunications technology has emerged as another area in which academic and research libraries need to develop overall strategies. The developments which have come together to raise decisions to a strategic level include:

1. *Telecommunication technology has become central to academic and research library operations.*

Telecommunications technology plays a central role in the close relationship between the nation's academic research libraries and the national bibliographic/resource-sharing networks. Online searching has become an essential component of reference service. Libraries have found themselves managing extensive telecommunications networks in support of their local library systems.

2. *Telecommunications technology is expensive, complex, and constantly changing.*

Costs related to use of telecommunications technology already account for a significant part of academic and research library budgets, including ongoing telecommunications charges to support access to bibliographic networks and local library systems, online searching costs, equipment costs for terminals, and telephone system costs. This technology is complex and changes rapidly, and highly specialized knowledge and skills are required to use it efficiently and cost-effectively.

3. *Telecommunications technology is playing an increasing role in the operations of academic and research library parent institutions and in scholarly activities.*

Universities are looking more and more to campus-wide telecommunications networks to improve access to campus computing resources and to provide researchers with gateways to national and international computer networks. As users come to rely on these networks for access to library online catalogs, they will increase their demands for access to other sorts of information such as databases of citations via the network.

Factors in Telecommunications Strategy Formulation

Some of the factors to be analyzed in the formulation and implementation of library telecommunications strategies include:

Existing library telecommunications configurations

- The existing library telecommunications configuration.
- Ongoing telecommunications-related costs including the phone system; leased data lines; modems; terminals—general-purpose workstations and specialized terminals; and local area networks.

Library workstation access and networking needs

- Staff and user needs for internal library networking.
- Staff and user needs for access to external networks and remote systems and databases.

Campus telecommunications network

- The current status and future development plans of the campus network.
- The role of the network in supporting library operations and services, especially access to the online catalog.
- The library's role in network planning and decision-making.

National bibliographic/resource-sharing networks

- The role of telecommunications technology in supporting the relationship of the library to the national networks.
- Planned changes in network configurations and their impact on the library.

Library telecommunications expertise

- The current level of telecommunications knowledge within the library organization and the need for basic "telecommunications literacy" among administrators.
- The current level of staff expertise, and the need for additional technical staff.

Funding options

- The current approaches to funding both one-time and continuing telecommunications costs.
- Alternative funding methods, including grants and special budget allocations.

Developing Strategic Goals

One approach to establishing overall library telecommunications strategies is to develop a series of strategic goals to guide decision-making. The following is offered as a starting point for discussion:

The library and the campus network

1. The library becomes a full participant in campus telecommunications planning and decision-making.
2. The library's online catalog becomes fully and conveniently accessible through the campus network.
3. The library makes full use of the campus network to provide innovative services to users, provide library staff with access to external networks and databases, and communicate with other units on campus.

Library workstation access and networking

4. The library regularly reviews staff and user access needs and expands and/or reconfigures library telecommunications resources such as modems, local area networks, local system terminal networks, data lines, and links to the campus network to meet these needs as effectively as possible.
5. The library establishes electronic mail and document distribution as a primary means of communication among library managers.

Relationship between the local library system(s) and other bibliographic systems

6. The library regularly reviews needs for access and transfer of data between the library and national bibliographic and resource sharing networks as well as current and alternative means of supporting these functions in order to assure that they are supported cost-effectively.
7. The library implements links and common interfaces between local library system(s) and other bibliographic systems when feasible and cost-effective.

Funding the expanded use of telecommunications technology

8. In planning the expanded use of telecommunications technology, the library investigates alternative sources of funding for one-time costs, such as grant funds and special budget allocations, while at the same time planning for the impact of continuing costs on the regular library budget.

Library telecommunications expertise and training

9. The library hires and maintains staff with the expertise necessary to support the use of sophisticated telecommunications technology, to train staff in its use, and to assist library administrators in planning for new and changing uses of this technology.
10. The library provides training to bring all library staff up to a basic level of understanding of telecommunications technology and its use in the library and university.

REFERENCES AND SELECTED BIBLIOGRAPHY

Telecommunications and libraries: general

Boss, Richard W. *Telecommunications for library management.* White Plains, NY: Knowledge Industries Publications, Inc., 1985.

Davison, Wayne E., compiler. *Telecommunications in ARL libraries.* Washington, D.C.: Association of Research Libraries, Office of Management Services, Systems and Procedures Exchange Center (SPEC Kit #98), October, 1983.

Jacob, M.E.L. *Telecommunications networks: issues and trends.* White Plains, NY: Knowledge Industry Publications, 1986.

Learn, Larry L. Networks: a review of their technology, architecture, and implementation. *Library Hi Tech* (Consecutive Issue 22): 19-49, (1988).

Martin, James. *Data communications technology.* Englewood Cliffs, NJ: Prentice Hall, 1988.

Martin, Susan K. *Library networks, 1986-87: libraries in partnership.* White Plains, NY: Knowledge Industry Publications, Inc., 1986.

Miller, R. Bruce, compiler. *Systems Office Organization.* Washington, DC: Association of Research Libraries, Office of Management Services, Systems and Procedures Exchange Center (SPEC Kit #128), October, 1986.

Molholt, Pat. *Library networking: the interface of ideas and actions.* Washington, DC: U.S. Dept. of Education, Office of Library Programs, June 1988. (Unpublished report on work supported by funding from the Office of Library Programs and performed while the author was on sabbatical from Rensselaer Polytechnic Institute.)

Local area networks

Curtis, Howard, editor. *Public access microcomputers in academic libraries: the Mann Library model at Cornell University.* Chicago: American Library Association, 1987.

Stallings, William. *Handbook of computer-communications standards, v.2: local network standards.* New York: Macmillan, 1987.

Urey, Gwen. Installing a local area network in a public access microcomputer center. In: *SCIL 1988.* March 7-9, 1988, Chicago. Westport, Conn.: Meckler, pp. 97-98, (1988).

The library and the campus network

Arms, Caroline, editor. *Campus networking strategies.* Bedford, Mass.: Digital Press, 1988.

Campus of the future: conference on information resources Dublin, Ohio: OCLC Online Computer Library Center, 1987.

Flower, Kenneth E. *Academic libraries on the periphery: how telecommunications information policy is determined in universities.* Washington, D.C.: Association of Research Libraries, Office of Management Services, (Occasional Papers, #11), 1986.

Miller, Ralph. Integrated services digital network (ISDN): telecommunications in the future. *Online* 11(2): 27-38, (March, 1987).

Moran, Barbara B.; Surprenant, Thomas T.; Taylor, Merrily E. The electronic campus: the impact of the Scholar's Workstation Project on the libraries at Brown. *College and Research Libraries* 48(1): 5-16, (January, 1987).

An overview of academic computing and networking at the Johns Hopkins University. Baltimore, MD: Johns Hopkins University, 1987.

Roberts, Michael M. Campus networking strategies: an introduction. *EDUCOM Bulletin* 23(1): 13-19, (Spring, 1988).

Taylor, Merrily E. *An on-line catalog in the context of a network of scholar's workstations: final report from Brown University to the Pew Memorial Trust.* Providence, Rhode Island: Brown University, January 15, 1988.

Van Houweling, Douglas E. The information network: its structure and role in higher education. *Library Hi Tech* (Consecutive Issue 18): 7-17, (1987).

Links and common interfaces for bibliographic systems

Denenberg, Ray. The Linked Systems Project and the maturing of open systems interconnection. *Library Hi Tech News* (48): 1-3, (April, 1988).

Fenly, Judith G.; Wiggins, Beacher, editors. *The Linked Systems Project: a networking tool for libraries.* Dublin, Ohio: OCLC Online Computer Library Center, 1988.

Luce, Richard E. IRVING: interfacing dissimilar systems at the local level. *Library Hi Tech* (Consecutive Issue 7): 55-61, (1984).

Luce, Richard E. The open online library system and networking: current developments and future trends. In: David C. Genaway, editor and compiler. *Conference on integrated online library systems,* September 23-24, 1986, St. Louis, Missouri. Canfield, OH: Genaway & Associates, pp. 59-70, (1987).

OSI reference model update. *Library Systems Newsletter* 7(9): 65-66, (September, 1987).

Alternatives to remote access

Georgia Tech wires campus for PC access to library. *Information Today* 4(5): 23, (May, 1987).

Hilditch, Bonny M.; Schroeder, Eileen E. Pertinent comparisons between CD-ROM and online. *ASIS Bulletin* 14(1): 15-16, (October/November, 1987).

Jackson, Kathy M.; King, Evelyn M.; Kellough, Jean. How to organize an extensive laserdisk installation: the Texas A&M experience. *Online* 12(2): 51-60, (March, 1988).

Tucker, Sandra L.; Anders, Vicki; Clark, Katharine E.; Kinyon, William R. How to manage an extensive laserdisk installation: the Texas A&M experience. *Online* 12(3): 34-46, (May, 1988).

Watson, Paula D. Cost to libraries of the optical information revolution. *Online* 12(1): 45-50, (January, 1988).